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or less partitionability; m is the same as n means in arithmetic that whatever has the numerical rank of m has also precisely the numerical rank of n no matter what summations or other numerical operations m or n may represent. Identity of this sort is arithmetical equality. It seems a simple relation for the reason that its intervention very decisively simplifies our arithmetical comprehensions. It is however a coincidence of two relations that are converse to one another. These relations are "not less than" and "not greater than." It is universally admitted that the more inclusive a notion or concept is in extension, the more simple and primary it is than any other notion or concept included as an instance under it. Now all equality is "not less than" but not all "not less than" is necessarily equality; hence, "not less than" is a wider and more primary notion than equality. On the same considerations "not more than" is in the same case. Equality is the limiting case between the variable and logically more simple cases of "not less than" and "not more than." The notion of quantity emerges on comparison however vague between any two objects that have size, independently of the notion of equality. If this were not true how could we have the notions of infinitely large and infinitely small.

It is indeed true that without the notion of equality the theory of numbers and the mathematical analysis could subsist in a rudimentary state only, but to say that they would not exist at all is rash and not maintainable. The relations "not less than" "not more than" would still allow of some truly mathematical propositions, operations, and calculations. In that essentially qualitative notation that is ordinary language the relation that corresponds to equality is of very limited range but a relation that is analogous to "not less than," viz., supersumption, is very efficient.

With a theory of numbers and a mathematical analysis using only the relations "not less than" "not more than" in lieu of the relation of equality the fundamental operations, addition and substitution, would find some scope of application and hence the derivative operations, multiplication, powering, etc., and their inversions, subtraction, division, etc., would obtain in some fashion and to some extent. This can readily be seen by any one who is familiar with the way in which expressions of inequality are used in modern mathematical analysis.

FRANCIS C. RUSSELL.

OBSERVATIONS ON SOME POINTS IN JAMES'S PSYCHOLOGY.

II. EMOTION.

Nothing in Professor James's work will be likely to strike the average reader as more paradoxical than his views on the subject of Emotion, which he must be allowed to state in his own words. After premising that he will limit his discussion, in the first instance, to what may be called the coarser emotions, as fear, grief, rage, love, in which every one recognises a strong organic reverberation, he goes on to say :

"Our natural way of thinking about these coarser emotions is that the mental perception of some fact excites the mental affection called the emotion, and that this latter state of mind gives rise to the bodily expression. My theory, on the contrary, is that the bodily changes follow directly the perception of the existing fact, and that our feeling of the same changes, as they occur, is the emotion. Common sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defended says that this order of sequence is incorrect, that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we strike, cry, or tremble, because we are sorry, angry or fearful, as the case may be. Without the bodily state following on the perception, the latter would be purely cognitive in form, pale, colorless, destitute of emotional warmth. We might then see the bear and judge it best to run, receive the insult and deem it right to strike, but we should not actually *feel* afraid or angry.

"Stated in this crude way, the hypothesis is pretty sure to meet with immediate disbelief. And yet neither many nor far-fetched considerations are required to mitigate its paradoxical character, and possibly to produce conviction of its truth.

"To begin with, no reader of the last two chapters will be inclined to doubt the fact that *objects do excite bodily changes* by a preorganised mechanism, or the farther fact that *the changes are so indefinitely numerous and subtle that the entire organism may be called a sounding-board* which every change of consciousness, however slight, may make reverberate. . . .

"The next thing to be noticed is this, that *every one of the bodily changes, whatsoever it be, is FELT, acutely or obscurely, the moment it occurs.* . . .

"I now proceed to urge the vital point of my whole theory, which is this: *If we fancy some strong emotion, and then try to abstract from our consciousness of it all the feelings of its bodily symptoms, we find we have nothing left behind, no 'mind-stuff' out of which the emotion can be constituted, and that a cold and neutral state of intellectual perception is all that remains.* It is true that, although most people when asked say that their introspection verifies this statement, some persist in saying that it does not. Many cannot be made to understand the question. When you beg them to imagine away every feeling of laughter and of tendency to laugh from their consciousness of the ludicrousness of an object, and then to tell you what the feeling of its ludicrousness would be like, whether it be anything more than the perception that the object belongs to the class 'funny,' they persist in replying that the thing proposed is a physical impossibility and that they always *must* laugh if they see a funny object. Of course the task proposed is not the practical one of seeing a ludicrous object and annihilating one's tendency to laugh. It is the purely speculative one of subtracting certain elements of feeling from an emotional state supposed to exist in all its fulness, and saying what the residual elements are. I cannot help thinking that all who rightly apprehend this problem will agree with the proposition above laid down. What kind of an emotion of fear would be left if the feeling neither of quickened heart-beats nor of shallow breathing, neither of trembling lips nor of weakened limbs, neither of goose-flesh nor of visceral stirrings, were present, it is quite impossible for me to think. Can one fancy the state of rage and picture no ebullition in the chest, no flushing of the face, no dilatation of the nostrils, no clenching of the teeth, no impulse to vigorous action, but in their stead limp muscles, calm breathing and a placid face? The present writer, for one,

certainly cannot. The rage is as completely evaporated as the sensation of its so-called manifestations, and the only thing that can be supposed to take its place is some cold-blooded and dispassionate sentence, confined entirely to the judicial realm, to the effect that a certain person or persons merit chastisement for their sins. In like manner of grief: what would it be without its tears, its sobs, its suffocation of the heart, its pang in the breast-bone? A feelingless recognition that certain circumstances are deplorable, and nothing more. Every passion in turn tells the same story. A purely disembodied human emotion is a nonentity." (P. 449 seq.)

It is, of course, impossible for me to give all the arguments by which Professor James attempts to establish his position; the above quotations will make it clear what it is—namely, that all our "feelings" are sensations.

Before proceeding to consider some of the objections to this view of the matter, it may be well to notice briefly what seems to be a gap in the author's treatment of it. In adult human beings, very few, comparatively, of what are ordinarily recognised as emotions follow directly upon the perception of their objects, in the ordinary sense of the word. His theory might perhaps suffice, without further explanation for such cases as the "spitting" of blind kittens at the smell of a dog, or the rage of a bull at the sight of a red cloth, or the startled feeling that we experience at a loud and unexpected sound, if the latter should be called an emotion. But in the immense majority of instances the emotions of which he treats arise in a very different way.

Some of his own illustrations will serve as well as any to show this. For instance, neither running nor any other of the symptoms of fear which he enumerates is the necessary result of seeing a bear. A chained or caged bear may excite only feelings of curiosity, and a well armed hunter might experience only pleasurable feelings at meeting one loose in the woods. It is not, then, the perception of the bear that excites the movements of fear. We do not run from the bear unless we suppose him capable of doing us bodily injury. Why should the expectation of being eaten, for instance, set the muscles of our legs in motion? "Common sense" would be likely to say it was because we object to being eaten, but according to Professor James, the reason we dislike to be eaten is because we run away. So, again, striking is not a reflex act, following on the hearing of an insult as sneezing does on taking snuff. Whether the muscular movements or the emotions are the primary thing, what both shall be depends on many things besides the words that are spoken. To be accused of drunkenness or unchastity, for instance, would dispose some persons to violence, but others might feel only the stirrings of pride at what they would consider a tribute to their manhood. In those who considered such a charge opprobrious, it might excite feelings of amusement, contempt, pity, or grief towards the one making it, according to the estimation in which he was held. To say that if it makes us strike we shall be angry, if it makes us laugh we shall be amused, if it makes us weep we shall be grieved, does not go to the bottom of the matter. According to the theory, the thought of the estimation in which we

are held by others is, in itself, entirely indifferent to us, and only affects our feelings through the muscular movements it excites.

In view of the variety of these movements in response to the same physical stimulus in a case like this, the statement that objects excite bodily changes by a preorganised mechanism explains nothing. We want to know why in one case a given perception excites one set of movements, and in another an entirely different set. Without attempting to decide whether or not a satisfactory explanation can be given on Professor James's hypothesis, I will only say, that, so far as I can see, he nowhere attempts it. In his section on "The Genesis of the Various Emotions," (pp. 477 seq.), he only discusses the question how the various feelings come to be associated with their respective movements. How the movements come to be associated with the perceptions, he does not discuss at all.

Turning now to the considerations which Professor James urges in support of his theory, quoted above, the first two—that objects excite bodily changes and that these changes are more or less distinctly felt—may pass unchallenged. I am disposed to go as far with him as to admit that these feelings, in the cases which he describes, may properly be considered components of the emotional state. But when he affirms that there is nothing else—that if we subtract our consciousness of peripheral sensations there would be no emotion left—it seems to me that he is going very much too far. I should have no hesitation in saying that such a statement of the case is contradicted by my consciousness, but as that would be merely setting up my consciousness against his, without the possibility of an umpire, I will call attention to some other considerations which seem to me to render it improbable.

In the first place, it is to be noticed that the cases he instances in illustration of his position are all of violent emotions. Admitting that we cannot have these emotions, in such degree, without movements such as he describes, nor even imagine how they would feel if such a thing were possible, it does not follow because they cannot be separated that they are identical. We do not reason in this way in regard to those feelings which are not commonly called emotions. I can no more imagine myself in intense bodily pain without a tendency to groan and writhe than deeply grieved without a tendency to weep, and yet no one, probably, would say that the pain consisted solely in my consciousness of the groaning and writhing. If grief is a kind of pain, it is to be expected that, in a high degree, it will produce bodily movements more or less similar to those excited by other sorts of pain. All these emotions, however, are capable of infinite gradations in intensity. The fear of losing one's pocket handkerchief is an emotion of the same kind as the fear of losing one's fortune. In Professor James's description of fear, it is evident that he has abject terror in mind. I hardly think it probable that he has any such sensations, when he fears, for instance, that he will be late to dinner, and yet he must be differently constituted from many of his fellow-men if his state of mind in such a case is merely a cold, intellectual cognition of the fact that such a state of affairs would be undesirable.

The same is true of the other emotions he mentions. The feeling of the ludicrous is, perhaps, the strongest case he cites, but in my own case slight degrees of amusement do not excite laughter, or even any conscious disposition to laugh. There is, at the most, in such cases, a tendency to smile, which may be overpowered by some other emotion, without in the least impairing my feeling of amusement. It seems to me certain that slight degrees of all the emotions mentioned may be unaccompanied by any distinct consciousness of reflex movements. In such cases it is only by a pretty strong effort of attention that we are able, if at all, to determine what the bodily changes are, although we are distinctly aware of the emotion.

Again, it is to be noticed that many actions, similar in character to those we have been considering, are not associated with what are commonly called emotions. Laughing and sobbing, for instance, are spasmodic movements of the muscles of respiration, not strikingly different from hiccuping, and there seems no good reason why the consciousness of the former two should usually be felt as strong emotional excitement, while the latter is not. In some cases, movements identical with those accompanying particular emotions may occur entirely independently of them. Shivering from cold, for instance, is the same sort of a movement as may occur in violent fright, but it does not make us feel frightened. The laughter excited in children and sensitive persons by tickling of the skin is not necessarily accompanied by any mirthful feelings. The act of vomiting may be the accompaniment of the most extreme disgust, or it may occur without a trace of such emotion. Professor James himself gives an instance of this sort that can hardly be bettered :

"The writer well remembers his astonishment, when a boy of seven or eight, at fainting when he saw a horse bled. The blood was in a bucket, with a stick in it, and if memory does not deceive him, he stirred it round and saw it drip from the stick with no feeling save that of childish curiosity. Suddenly the world grew black before his eyes, his ears began to buzz, and he knew no more. He had never heard of the sight of blood producing faintness or sickness, and he had little repugnance to it, and so little apprehension of any other sort of danger from it, that even at that tender age, as he well remembers, he could not help wondering how the mere physical presence of a pailful of crimson fluid could occasion in him such formidable bodily effects" (p. 457).

Here we have a condition such as is sometimes experienced in connection with the most extreme degree of fear or grief unaccompanied by any emotion except astonishment at its occurrence. I presume that if a person should faint on hearing bad news, Professor James would consider that one of the causes of his intense emotion. Why did it have no such effect in this case ?

Assuming that the emotions are the effects and not the causes of what are usually reckoned as their "expression," it seems evident that a given movement or set of movements must uniformly, at least in the same subject, give rise to the same feeling, and that in the case of opposite emotions such as joy and grief, hope and fear, the more intense the emotion, the more unlike must be the actions from which

it arises. Neither of these is the case. On the contrary, it would seem to be the fact that the actions accompanying emotion tend to become more alike in proportion to its intensity. It is not at all uncommon for people to weep from excess of joy as well as of grief. Pallor and trembling are frequent accompaniments of the extremes of hope as well as fear. The naturalist Wallace gives an account of his feelings on capturing a rare and beautiful butterfly, which is worth quoting in this connection :

"The beauty and brilliancy of this insect are indescribable, and none but a naturalist can understand the intense excitement I experienced when I at length captured it. On taking it out of the net and opening the glorious wings, my heart began to beat violently, the blood rushed to my head, and I felt more like fainting than I have done when in prospect of immediate death. I had a headache the rest of the day, so great was the excitement produced by what will appear to most people a very inadequate cause" ("Malay Archipelago," p. 342).

Here it is evident that a feeling of intense exultation gave rise to sensations very similar, to say the least, to those of extreme fear.

One other argument brought forward by the author deserves special notice in this connection :

"The best proof that the immediate cause of emotion is a physical effect on the nerves is furnished by *those pathological states in which the emotion is objectless*. One of the chief merits, in fact, of the view which I propose, seems to be that we can so easily formulate by its means pathological cases and normal cases under a common scheme. In every asylum we find examples of absolutely unmotivated fear, anger, melancholy, or conceit, and others of an equally unmotivated apathy, which persists in spite of the best of outward reasons why it should give way. In the former cases we must suppose the nervous machinery to be so 'labile' in some one emotional direction that almost every stimulus (however inappropriate) causes it to upset in that way, and to engender the particular complex of feelings of which the psychic body of that emotion consists. Thus, to take one special instance, if inability to draw deep breath, fluttering of the heart, and that peculiar epigastric change felt as 'precordial anxiety,' with an irresistible tendency to take a somewhat crouching attitude and to sit still, and with perhaps other visceral processes not now known, all spontaneously occur together in a certain person ; his feeling of their combination *is* the emotion of dread, and he is the victim of what is known as morbid fear" (p. 458).

Now, it is evident, of course, in such a case as this, that such a combination of feelings as is here described is not a fortuitous coincidence of so many independent sensations. They must have a common starting-point, which cannot well be elsewhere than in the brain. But if this is the case, it seems to me to be begging the question to assume that the sensations and not the emotion are the primary thing. On the assumption that fear, in the normal condition, is the cause of the disturbances of respiration, circulation, and the like, which accompany it, it is as easy to formulate normal and pathological cases under a common scheme, by supposing it to be the cause of the like disturbances in cases of morbid fear, as on the theory of Professor James.

It seems to me, then, that the theory does not satisfactorily account for the facts, so far as the involuntary, reflex accompaniments of motion are concerned.

The difficulty is greatly increased when we consider the relations of emotion to voluntary action. We have seen that reflex acts, similar to, or identical with those in which Professor James believes emotion to consist, may occur independently of emotion, in the ordinary acceptation of the term, at least. Strictly voluntary acts, on the contrary, are always the concomitants of emotion of some sort. In the great majority of the ordinary actions of life, they are the only motor phenomena of which we are aware in this connection. Our whole daily conduct, in our business and pleasure, our incomings and our outgoings, our downsitings and uprisings, is inseparably associated with our likings and dislikings, our hopes and fears. What is the nature of this association?

Under the theory we are considering, two relations of voluntary acts to emotion are possible. They may, like the involuntary reactions, constitute the emotion, or unlike them, result from it. Professor James does not express himself on the general question, but some of his illustrations seem to favor the former view. If the man who meets a bear is frightened because he runs, or the one who is insulted, angry because he strikes, the voluntary acts of running and striking must, in part, at least, constitute the emotions of fear and anger in these cases. Let us, then, consider this case first.

If I see a shower coming up, and run for a shelter, the emotion is evidently of the same kind, though perhaps less in degree, as in the case of the man who runs from the bear. According to Professor James, I am afraid of getting wet because I run. But supposing that, instead of running, I step into a shop and buy an umbrella. The emotion is still the same. I am afraid of getting wet. Consequently, so far as I can see, the fear, in this case, consists in buying the umbrella. Fear of hunger, in like manner, might consist in laying in a store of provisions; fear of poverty, in shoveling dirt at a dollar a day, and so on indefinitely. Anger, again, may be associated with many other actions than striking. Shylock's anger at Antonio's insults induced him to lend him money. Did the anger, or revengefulness, or whatever we may call the passion, consist in the act of lending the money? I hardly think it necessary to multiply instances in illustration of the fact that the same act is often associated with the most contradictory emotions, and acts which are ordinarily indifferent with the most intense feeling; that, in fact, there is no such uniformity in the associations of emotion with voluntary conduct as the hypothesis would seem to require. I incline to think that most people will believe, in the cases cited by Professor James, that the running and the striking are the results, not the causes of the fear and anger.

If we assume such to be the case, we are no better off under the hypothesis we are considering. Excluding voluntary movements, there is nothing left of the emotion, according to Professor James, but the consciousness of involuntary, reflex acts resulting from perception. The voluntary acts must, then, be directly caused by these. Now,

in the first place, it is often difficult, if not impossible, to tell what these actions are. What are the involuntary muscular contractions that impel a day-laborer to go to the place of his work, and keep his voluntary muscular system in strenuous activity all day, enduring fatigue and all the discomforts of the summer's heat or winter's cold? It would probably puzzle him very much to tell, although he has a very clear idea of why he does it. I doubt if, on his own hypothesis, Professor James himself would find it easy to explain the constituents of the emotions which impel him to go to the class-room at the appointed hour and conduct a recitation. But even in cases in which we are distinctly conscious of involuntary action, there seems to be no connection between it and the voluntary acts accompanying the emotion. In the case of the man running from the bear, for instance, trembling lips, weakened limbs, goose-flesh and visceral stirrings have nothing to do with running, but, on the contrary, would rather tend to prevent it. In fact, it may be said, in general, that the two classes of emotional activities are mutually antagonistic. The more involuntary the action, the less efficient the voluntary activity is apt to be, as any one knows who has had an attack of the "buck ague." We should have, therefore, diminution of the effect with increase of the cause.

It seems, then, on the hypothesis, impracticable to account for the association of voluntary action with emotion either on the supposition that the former is the cause or the result of the latter. A third alternative—that there is no relation of cause and effect in the case, and that the phenomena of emotion and action, although constantly associated, are really independent, I will not discuss, as it does not commend itself to my mind, and Professor James, elsewhere, expressly repudiates it. It seems to me that the only reasonable conclusion is that emotion is something different from either involuntary or voluntary muscular activity, and which may be the cause of either or both.

Professor James, after admitting that the view of the subject which he advocates is only a hypothesis, and that much is lacking to its definitive proof, goes on to say:

The only way coercively to *disprove* it, however, would be to take some emotion and then exhibit qualities of feeling in it which should be *demonstrably* additional to all those which could possibly be derived from the organs affected at the time. But to detect with certainty such purely spiritual qualities of feeling would obviously be a task beyond human power.

"A positive proof of the theory would, on the other hand, be given, if we could find a subject absolutely anæsthetic inside and out, but not paralytic, so that emotion-inspiring objects might evoke the usual bodily expressions from him, but who, on being consulted, should say that no subjective emotional affection was felt. Such a man would be like one who, because he eats, appears to bystanders to be hungry, but who afterwards confesses that he had no appetite at all." (P. 455.)

Whether the truth of the first of the above paragraphs is to be conceded or not, depends, I suppose, on the strength of proof necessary for coercion. The only way, for instance, coercively to disprove the once prevalent theory that "lunacy" is due

to the influence of the moon would be to abolish the moon. Most intelligent people, however, at the present day, accept the fact that there seems to be no coincidence between the moon's phases and the phenomena of insanity as sufficient proof for practical purposes of the incorrectness of that theory. It seems to me that the facts to which I have called attention show a somewhat similar lack of correspondence in the case we have been considering. I am, however, unable to see why a case of complete anæsthesia, such as is supposed in the second paragraph, would not answer nearly as well for one side of the question as the other, according to the presence or absence of emotion. To suppose that cutaneous and visceral sensations are preserved unimpaired for purposes of emotion, while absolutely abolished for all other purposes, would be putting a pretty severe strain on the faculty of belief.

Such cases, as Professor James says, are hard to find. He refers to one, reported by Strümpell, in which a boy, anæsthetic within and without, with the exception of one eye and one ear, was stated to have manifested shame, grief, surprise, fear, and anger. He goes on, however, to say: "In observing him, however, no such theory as the present one seems to have been thought of; and it always remains possible that, just as he satisfied his natural appetites and necessities in cold blood, with no inward feeling, so his emotional expressions may have been accompanied by a quite cold heart."

Since Professor James's work was published, two cases have been reported by Berkley,* which, although not, perhaps, conclusive, are of interest in this connection. In the first, the patient, a woman of English birth, age not stated, had complete loss of sense of pain, heat and cold, pressure and equilibrium, of smell, taste, and sight. The sense of touch, although not completely abolished, was very greatly impaired. She recognised a hat, for instance, only after feeling of it for a long time and then seemed doubtful about it. Her sense of the position of the extremities was also very imperfect, although not entirely abolished; and there was some deafness, although not enough to render her incapable of conversation. With regard to her mental state, Dr. Berkley says:

"The psychical condition has undergone but slight change, she is possibly a little apathetic, with some slight tendency towards a melancholic tone, but when aroused and induced to converse for some time, this in great measure passes away. The memory is quite good."

Dr. Berkley was kind enough to give me the following additional information about this patient, who, at the time of writing, was still under observation:

"Since the coming on of the dullness in hearing there has been a considerable degree of apathy manifest. She is no longer conscious of the smaller noises that occur around her, but is very readily aroused by the voice, and then takes a lively

* *Two Cases of General Cutaneous and Sensory Anæsthesia, without Marked Psychological Implication.* By Henry J. Berkley, M. D., Baltimore. [Brain, Part IV, 1891.]

interest in what is said to her : for instance a few days ago the resident physician remarked to her that he was going to obtain a pair of crutches for her use ; she laughed heartily at the idea, and said she would fall and break her leg at the first step."

In response to further inquiries, he writes as follows :

"1) Visceral sensations. The clearest evidence of visceral sensation I have noted in my article," [warning of the necessity of evacuating the bowels and bladder by a pricking pain in the lower part of the abdomen,] "no others were sufficiently definite to be described. For two years there has been no feeling of hunger or thirst, and as the diet has only been a few mouthfuls of milk at a time for nearly that period, there has been no feeling of repletion.

"2) When the patient laughs at a joke, there is a slight flushing of the face, besides the ordinary contraction of the facial muscles ; she is aware that she is laughing, but besides acknowledging that she perceives no difference between the act now, and some years ago, she is unable to describe the sensation further.

"3) Anger. As I think I mentioned in my last letter, the patient has been a person of unusually equal temper ; an outbreak of real passion has never been observed with her. When annoyed or teased by some of the other women, there is a distinct corrugation of the forehead, accompanied by an exceedingly slight general movement as if of aversion, no words, movement of the chest, clenching of the hands, etc. She describes the sensation as one of repulsion.

"Like Strümpell's case she shows definitely shame, grief, surprise, fear, and substituting for anger, repulsion.

"My own impression derived from observation of the patient is, that all mental emotional sensibilities are present and only a little less vivid than in the unanæsthetic state ; and that emotions are approximately natural, and not at all coldly dispassionate."

In the second case, that of a Russian woman, aged thirty-five, there was complete loss of cutaneous sensibility in all its qualities : the sense of position ("muscular sense") was almost completely abolished ; the sense of taste was absent in the anterior two-thirds of the tongue. Smell, sight, and hearing were preserved. She had left the hospital before the article was written. In regard to her case, Dr. Berkley writes :

"While in the most absolute state of anæsthesia (auditory and visual excepted) there was no departure from a normal psyche ; the woman would sometimes be angered when she did not understand a question, at others would smile or shake her head, and would frequently laugh and talk with another Russian woman in the same ward. There was never the slightest apathy manifest after the first few days of febrile movement."

I give these cases for what they are worth. In the first, it is evidently impossible to entirely exclude the presence of sensations caused by the reflex acts, and the second, not having, apparently, been examined with special reference to the subjective side of her emotional manifestations, may be open to the same objection which Professor James makes against Strümpell's case. To me it seems extremely unlikely that, if the theory under discussion is correct, such an amount of anæsthe-

sia as existed in these cases would have produced no obvious effect on the emotions. The fact that voluntary acts were performed by both these patients as well as by Strümpell's case, seems to me conclusive as to the existence of emotions of some sort in all of them.

It seems clear to me, from the foregoing considerations, that there are serious difficulties in the way of accepting Professor James's theory as an adequate explanation of all the phenomena of emotion. On the other hand, I think it contains an important truth, and that, by calling attention to it, he has rendered a real service to psychology. In order to make it clear how far I agree with him, it will be necessary to consider just what feelings are to be classed together under the head of emotion.

If we touch our fingers to a live coal, we are conscious of a sensation of heat, and also of pain. If we take quinine into our mouths, it tastes bitter, and also disagreeable. So in regard to a very large proportion of our sensations, we recognise two elements—one which has to do with the qualities of the object, and another consisting of the pleasurable or painful way in which those qualities affect us. The former may be called the objective element in sensation. We think of the heat as residing in the coal, whether we are touching it or not, but it never occurs to us to think of the coal as in pain. The pain is in us—an entirely subjective feeling. Doubtless there is no more reason to think of heat, as it is appreciated by our senses, as a property of the coal, than pain, but that is the way in which we naturally think of it. That these two elements are really distinct is evident from the fact that the different senses furnish them in different proportions. Comparatively few sights, for instance, give any such sensuous pain to the eye as the sensation produced by getting a grain of sand under the lid, which gives us very little information in regard to the qualities of the offending substance. In fact, it is generally true that intensity of pleasurable or painful sensation is a hindrance to exact knowledge of its object. It is further evident from the fact that, in disease, one form of sensibility may be abolished while the other is retained. A person may be able to feel the slightest touch, and to recognise perfectly the size, shape, and texture of the objects he handles, and yet feel no pain when cut, struck, or burned, or he may have even heightened sensibility to painful impressions with loss of the power to recognise the sensible qualities of objects.

Now, although we are accustomed to distinguish between emotions and purely sensuous pleasures and pains, there are some points, at least, at which it is not easy to draw the line. My pleasure in the anticipation of a good dinner is undoubtedly an emotion. Is not my pleasure in eating it entitled to the same name, and does not the latter consist in the reality of the sensations which in the former case were enjoyed in imagination? Is not the enjoyment we feel in the smell of mignonette, the tone of a sweet voice, the color and form of the rainbow, emotion? Yet it consists largely, if not entirely, in the agreeableness of the sensations. Most people would probably think it strange to hear hunger and thirst spoken of as emotions

but would readily agree that desire of food or drink is as much an emotion as any other desire. Is the desire in this case anything more than the hunger or thirst?

I am inclined to think that it is proper to call such pleasures and pains as I have instanced above emotions, and if so, I see no reason for denying the name to any sensuous pleasures and pains. If Professor James's view is that all feeling is sensation, I should say that all feeling is emotion. Whether this view is correct or not, I do not see how Professor James can consistently refuse to accept it. On his theory, the emotions which he discusses must owe their pleasurable or painful quality to the pleasurable or painful nature of the sensations in which they consist. I can see no valid ground for saying that some such feelings are emotions and others are not. But the essence of emotion is pleasure or pain. Abstracting these qualities, it would be an indifferent emotion, which, I think all would agree, is a contradiction in terms. Possibly he might wish to limit the use of the term to those pleasurable and painful feelings, which arise not directly, but in a reflex way. He might say, for instance, that the disagreeableness to the ear of the creaking of an ungreased axle is not, but the shudder which it gives a sensitive person is, emotion. In that case, it must be admitted that a sneeze is emotion. His contention is that we have no other pleasures or pains than those of sensation. If this be true, a setting off of some sensations as emotions is, if not an arbitrary, a comparatively useless procedure.

My own view, then, is that the elements of sensation which I have spoken of as objective and subjective might, with equal propriety, be characterised respectively as intellectual and emotional, and that in this direction the theory under discussion, although true as far as it goes, does not go far enough.

However this may be, the admission or denial that these feelings are emotions does not necessarily affect the question whether or not this is the only origin of pleasure and pain. As has already been said, those feelings to which no one will deny the name of emotions are not usually, in adult human beings, at least, direct reactions on sensation. If it be true that the start we give at the unexpected slamming of a door is a sort of fright, it is a very rudimentary sort compared with that which one feels when the cry of fire is raised in a crowded theatre. "A burnt child dreads the fire." It is not the sight of the fire, but the thought of the burning, that arouses the emotion. When a man reads in the newspaper of the death of a friend, or a rise in the value of property in which he is interested, it is not the sight of the black marks on the white paper, but the beliefs which, through a long and intricate series of associations they call up, which move his feelings. If he could not read, he would see the same announcement without any emotion. The usual origin of the emotions *par excellence* is by way of association.

Suppose that I have taken a nauseous dose, and made a wry face over it. No one, I presume, would question that the disagreeableness lay in the unpleasant taste, and not in the distortion of the countenance. Now, suppose I have to repeat the dose, and my face takes on a similar expression at the anticipation to that which

it wore when I took it originally. How does this come about? If I can trust my own consciousness, it is because the vivid reproduction, in memory, of the unpleasant taste is itself unpleasant. I do not see how it can well be otherwise. Professor James says (p. 649) that "the first element of memory is the revival in the mind of an image or copy of the original event." How can I have a copy in my mind of a pain if it is not painful? Take away the painfulness of it and there would be nothing left. I might remember the circumstances under which it occurred, and judge from them that I must have suffered pain, but I could not, it seems to me, remember the pain itself. Whether that is possible or not, I feel sure that the fact, in my own case, is, that my memory of a pain resembles it in the same way that my memory of the circumstances in which it occurred resembles them. If this be the fact, what can be more natural than that it should excite the same sort of associated movements that were excited by the original sensation? I cannot make it seem any more credible, to return to the example mentioned above, that my repugnance to a repetition of the dose is due to my involuntary movements than that my discomfort in taking it originally was due to the similar movements that occurred then.

Suppose that a child who has eaten and enjoyed an orange is offered another. The sight of it calls up the recollection of the agreeable taste, and the expectation of a repetition of the pleasant experience excites expressions of pleasure. If the fruit is snatched away, the disappointment at the loss of the expected pleasure is distressing, and very probably may result in his weeping. I hardly think that any one who will consult his own consciousness will say that the reason he likes the taste of an orange is that it makes him laugh or smile to get it. He likes it because it tastes good, and is sorry to lose it for the same reason. The laughing or weeping is, I think, unquestionably the result of the pleasure or grief, not of the mere perception of an object in itself indifferent.

It is true that emotions of this sort do not always arise by way of personal association. Young children are apt to be afraid of strangers, of large animals, and of loud noises. I can remember being frightened at my first sight of a locomotive. Here we come upon the questions of inherited experience and natural selection, which can hardly be discussed in an article like this. The objects of which young children are instinctively afraid, as a rule, are either dangerous themselves, or more or less similar to dangerous objects. I see no more difficulty in supposing that mental pleasure and pain, on the sight of special objects, may be a matter of organisation than in the case of the analogous physical sensations.

My view of the matter, then, is that emotion in the sense in which the word is commonly used bears the same relation to perceptions or beliefs that feelings of physical pleasure or pain do to the objective or intellectual quality of sensations. I am inclined to think it proper to class all pleasurable and painful feelings together as emotions. If this view is correct, it would, of course, include those feelings to which Professor James would confine the term. I should not at all hesitate to admit that the emotional state of a person who trembles and turns pale with fear is

different from that of one who preserves his self-possession in the presence of a danger that he realises and dreads. I think it is true that the voluntary actions prompted by an emotion have some tendency to intensify it. But, so far as I can analyse my own feelings, the pleasures and pains of memory and imagination seem to me just as real as those of sensation, and not at all to be confounded with them. When I try to subtract all motor reactions and resulting sensations from the feeling of fear, for instance, there remains not merely the intellectual perception that the event dreaded is not desirable, but the perfectly distinct emotional consciousness that I do not desire it.

This view seems to be favored by the analogy between the relations of sensation to reflex movement on the one hand, and of perception to voluntary movement on the other, which will, I think, be found to be very complete. We have reflex acts which are useful, such as breathing, the beating of the heart, swallowing and coughing; and others, like groaning, weeping, and trembling, which seem to be useless. In like manner, emotions of hope or fear may give rise to voluntary acts calculated to enable the subject of the emotion to secure or avoid its object. If I burn my fingers, my hand is involuntarily snatched away. Such would not be the case if the burn caused no pain. If I see that the house is on fire, I try to escape, either by extinguishing the fire or by getting out of the house. It seems to me evident that I should not do so if the thought of being burned were not painful. Such emotions may also occasion useless acts, more or less similar to those mentioned above. A person who saw no way of escape from a burning house might tremble, weep, or groan from fear.

On the evolutionary hypothesis, it seems easy to understand how the reproduction, by memory or imagination, of certain feelings might bring about movements like those excited by the original feelings. Professor James would have us believe that this reproduction is always, in itself, indifferent, that is, merely intellectual; but that it is, nevertheless, capable of setting up the movements which, in the case of peripheral stimuli, are the results of pleasure and pain, and that the consciousness of these movements is, in such cases, the sole cause of the emotional condition. Such a reversal of relations seems to me highly improbable. Each one must decide for himself which view is more in accordance with the facts of his own consciousness.

W. L. WORCESTER.

PROFESSOR ERNST MACH'S TERM SENSATION.

SUPPLEMENTARY TO HIS CONTROVERSY WITH THE EDITOR.

The Monist, Vol. I, No. 3, contains a controversy between Prof. Ernst Mach and myself on some questions of psychophysics in which Professor Mach, having reference to an editorial article on "Feeling and Motion," regards sensations as the "elements of reality," "while motion," he says, "is a mere mental auxiliary, an